



United States
Department of
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Food and
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Service

3101 Park Center Drive
Alexandria, VA 22302

THE RELATIONSHIP BETWEEN OVERPAYMENTS AND UNDERPAYMENTS IN THE FOOD STAMP PROGRAM: AN UPDATED ANALYSIS

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A product of
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EXECUTIVE SUMMARY

This study addresses the concern that federal emphasis on reducing overpayment error might serve to increase underpayment error in the Food Stamp Program. Under the federal quality control policies that prevailed throughout most of the 1980s, States were subject to fiscal liabilities if they exceeded a target error rate for benefit issuances to ineligible cases and overissuances to eligible cases.¹ No penalty existed for underissuances to eligible cases, nor for erroneous denials or terminations of assistance. The unbalanced treatment of overpayment and underpayment error raised the possibility that States, in seeking to control overpayment error and thereby avoid liabilities, might divert their attention from underpayments and allow such errors to rise. This analysis uses food stamp error rates by State from 1980 through 1990 to examine whether this concern has any empirical basis and whether error patterns have shifted since passage in 1988 of the Hunger Prevention Act.

The experience of States in the Food Stamp Program during the 1980s indicates that lower overpayment error has not been accompanied by higher underpayment error. To the contrary, the evidence examined here suggests that lower overpayments have been associated with lower underpayments. This relationship is found when one examines either the cross-sectional variation in error among States or--more pertinently--the year-to-year variation in error for individual States. In addition, there is no evidence to suggest that those particular States previously needing to reduce overpayment error to avoid liabilities have systematically experienced increases in underpayment error. These findings are all based on a measure of underpayments that includes underissuances to eligible cases but does not include erroneous denials or terminations.

The analysis undertaken in this study has addressed three specific questions, with the following results:

¹For Fiscal Years 1981 and 1982, States were subject to liabilities for excessive errors based on the "cumulative allotment error rate" for both overpayment and underpayment errors. This policy approach was then reinstated by the Hunger Prevention Act of 1988, retroactive to Fiscal Year 1986.

Do error rate comparisons from State to State indicate that food stamp overpayments and underpayments are systematically related to each other, either positively or negatively? In cross-sectional variation, the error rates for overpayments and underpayments are positively related. Thus, States with relatively low error of one type tend also to have relatively low error of the other type. For instance, a State whose overpayment error rate is below the median in one period tends also to be below the median error rate for underpayments in the same period. The correlation coefficient between overpayment and underpayment error was found to be positive in each of the eleven years under study. These findings must be interpreted with caution, however, for the relative performance of States may reflect the influence of such factors as caseload demographic characteristics and socioeconomic conditions, as well as administrative actions.

Are individual States able to reduce their food stamp overpayment error rate without increasing their underpayment error rate? This is the more relevant question in addressing concerns about the need to control both overpayment and underpayment error. Several separate findings support the judgment that States are able to reduce overpayments with no worsening of their underpayment error rate.

- The correlation coefficient between dollar error rates for overpayments and underpayments, when computed separately by State for the eleven-year interval of generally declining overpayments, was positive and statistically significant for thirteen States. For only two States was the coefficient significantly negative.
- Correlations between the year-to-year changes in overpayments and underpayments observed among all States were also generally positive.
- Year-to-year movement in the overpayment and underpayment error rates--if statistically significant--tended to be in the same direction for both types of error. However, more than two-thirds of the observed error rate changes are not different from zero at the 10 percent significance level.
- In instances where States needed to reduce their overpayment error rate to avoid an impending liability, with no similar pressure to reduce underpayments, there was no evidence to suggest any corresponding upward movement in underpayment error.
- In a multiple regression model accounting for State-specific and year-specific effects on error, a lower level of overpayments was significantly associated with a lower level of underpayments.

Since enactment of the Hunger Prevention Act, do error rate patterns suggest that States are adopting a more balanced effort to control both overpayment and underpayment? The error rates in 1989 and 1990 reflect no discernible shift in the mix of overpayment and underpayment errors. This recent period shows no departure from previous years in the correlation between overpayment and underpayment error. The multivariate analysis of error rates for 1980 to 1990, accounting explicitly for State-specific effects on error, also reveals no pattern in State performance for either 1989 or 1990 that differs from the previous several years.

In summary, this analysis finds no empirical support for the hypothesis that federal emphasis on reducing overpayments may prompt increasing underpayments. However, the limitations of available data warrant caution in interpreting the evidence. Most importantly, the underpayment error rate accounts only partially for the potential adverse effects on households. It reflects neither the extent of erroneous denials or terminations (negative case action errors) nor the extent of "caseload churning" among eligible households who reapply after being denied or terminated for procedural reasons. There is no reliable information on these latter forms of benefit loss or procedural burden to households. Second, the eleven-year historical period--while including all years during which liabilities have been in effect--allows only limited analysis of the year-to-year variation in error rates by State. Third, the data reflect some changes over time in the measurement of error rates. For example, changes occurred during the period in the statistical adjustments that reflect the findings of the federal subsample re-review and that account for State noncompletion of case reviews. Fourth, there is only limited information on the sampling error of the official error rates, restricting the extent to which one can assess the statistical significance of year-to-year changes in error rates.

The first issue above, the lack of information on negative case action error or other adverse effects on households, is the most serious data limitation. Unfortunately, there is no way to assess its implications. The other issues appear to be of relatively minor importance and arguably do not influence the findings in any important fashion.

A final caveat is that the factors influencing error rates are subject to varying degrees of State and local administrative control. Without an elaborate modelling approach and much more data, however, one cannot estimate separately the effects on error of these various factors. The nature of controllable variation is of most interest to this study. Greater attention is thereby

focused here on the pattern of year-to-year changes in error rates by State, rather than the State-to-State comparison of error rate levels. The presumption is that the pattern of year-to-year variation reflects more the administrative changes within each State than it does the shifts in external conditions. However, the historical period under study saw major changes in the economy and program policy. Since the observed movement of overpayment and underpayment error for each State reflected in part the influence of such factors, the findings are limited in what they suggest about the effects of State and local administrative actions on the resulting mix of error in the Food Stamp Program.

CHAPTER ONE

INTRODUCTION

Federal quality control (QC) policy in the Food Stamp Program seeks to promote payment accuracy by offering "enhanced funding" or "incentive payments" to low-error States and imposing fiscal "liabilities" or "sanctions" on high-error States. Under the Food Stamp Act of 1977 and its subsequent amendments, enhanced federal funding of food stamp administrative costs is offered to States that achieve low error rates for issuances to ineligible cases, overissuances and underissuances to eligible cases, and erroneous denials and terminations. Until recently, however, fiscal liabilities have been based on State performance with respect only to overpayment error--that is, issuances to ineligible cases and overissuances to eligible cases.

From the enactment of the Food Stamp Amendments of 1982 until the passage of the Hunger Prevention Act of 1988, States faced no adverse consequence for high rates of underpayment error. This different treatment of overpayments and underpayments in prior QC policy gives rise to the present study. A persistent criticism of the previous policy was that, by establishing a stronger incentive for States to control overpayments than underpayments, the federal government may have prompted States to take actions that increase underpayments. In early response to this concern, the Food and Nutrition Service (FNS) conducted a study in 1985 to examine whether the system of error rate liabilities in the Food Stamp Program has "caused an emphasis on overpayment errors to the detriment of improving all payment errors" and whether this emphasis has "resulted in administrative decisions that encourage judgments against clients."¹ The historical period under study included the eight semiannual quality control reporting periods during Fiscal Years 1980 to 1983. The major findings of the FNS study were as follows (pp. i-ii):

¹See U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation, "The Relationship Between Overpayment and Underpayment Error Rates in the Food Stamp Program: A Preliminary Analysis," by Robert Dalrymple, November 1985.

- "...this analysis suggests that the error sanction system has not resulted in increased underpayment error rates."
- "Analysis also suggests that there is no statistically significant correlation of the national error rates; i.e., national overpayment error rate levels are not systematically associated with national underpayment error rate levels."
- "...on an individual basis, only a few States had significant correlations, and these were mixed between positive and negative correlations."
- "The most consistent relationship found [on an individual State basis] is that States with high overpayment error rates also tend to have high underpayment error rates..."

The report noted the limitations posed by the small number of observations per State, the lack of variability in the underpayment error rate, and the exclusion from the underpayment measure of forgone benefits due to erroneous denials or terminations.

Abt Associates then completed a study in 1988 that updated the FNS research, employing QC data through 1986, conducting a wider range of statistical tests on the degree of association between overpayment and underpayment, and including multivariate modelling as well as bivariate analysis of error rates.¹

A. STATEMENT OF THE RESEARCH QUESTION

The present study re-examines the relationship between overpayment and underpayment error, employing more recent data than the 1988 Abt study and again using different empirical methods than those in the 1985 FNS research. The question to be addressed is as follows:

Do the food stamp error rates by State since 1980 suggest that federal policy emphasis on reducing overpayment error might promote increased underpayment error?

As did the November 1985 FNS report, this study adopts the State as its unit of analysis. In any given period, each State is viewed as administering the Food Stamp Program under basic federal policy provisions that are common nationwide, but under State-specific circumstances regarding the demographic characteristics of the client population, the prevailing socioeconomic conditions,

¹Gregory B. Mills, "The Relationship Between Overpayments and Underpayments in the Food Stamp Program," Abt Associates Inc., Cambridge, Mass., September 1988.

and--most importantly for this study--the administrative procedures employed in caseload management. Because of the substantial within-State variation that may exist along any of these latter dimensions, each State might be more appropriately viewed as a set of heterogeneous localities. This study, however, does not explicitly address such internal diversity and treats each State as effectively uniform within its boundaries.

The choice of administrative practices in each State is considered here to be responsive in some measure to the federal government's quality control policies, to the extent that such policies alter the financial (and political) consequences of committing errors, through threatened fiscal liabilities and available incentive payments. The annually-determined error rates for overpayments and underpayments in each State, as sample measures of the degree of payment accuracy achieved during that period, reflect importantly (but not solely) the choice of administrative practices. The key issue under consideration here is whether this link between federal quality control policies and State administrative practices is such that the federal policy emphasis on the reduction of overpayments has prompted States to adopt administrative practices that, while serving to reduce overpayments, have also served to increase underpayments.

There are several arguments by which one would not expect the error rate data to show rising underpayments as a consequence of efforts to control overpayments. First, both overpayments and underpayments should be reduced if the administrative response to threatened liabilities is to become more error-conscious in general and to take more care in collecting, verifying, and processing client information and in applying policy rules. Second, if the measures to reduce overpayments focus predominantly on such program elements as client assets, for which overpayment error is the only type of error that might result, the corrective actions should have little effect on underpayments. Third, if overpayments and underpayments are separate error phenomena, arising from different sources and responding independently to administrative actions, one expects to find no systematic relationship between them. Finally, for portions of the historical period (i.e., during 1980-82 and 1989-90), the prevailing legislation based fiscal liabilities on an error measure that included underpayment.

The countering arguments, that underpayments might increase in conjunction with efforts to reduce overpayments, focus on the role of uncertainty and discretion in deciding client

eligibility and benefits.¹ If program managers, supervisors, and caseworkers respond to the threat of liabilities by shifting the "burden of proof" upon the client in situations of questionable case information or ambiguous program policy, there is arguably an increased risk of underpayments.

These scenarios are not mutually exclusive for any State, and one expects States to differ from each other in their response to liabilities. The empirical question is whether the observed experience of States is more supportive of one view or another.

Before presenting any findings, it is important to consider the differing inferences allowed by comparing error rates across States at different time periods versus comparing error rates over time for individual States. Previous analysis has shown that demographic or socioeconomic factors significantly affect interstate variation in food stamp error rates.² Thus, a cross-sectional finding that overpayment and underpayment error rates are positively correlated does not necessarily indicate that individual States acting to reduce one type of error have also typically experienced a reduction in the other type. The cross-sectional variation may simply indicate that the differences between States in the program's operating environment have enabled some to achieve lower levels of both error types, totally apart from the administrative practices in use. Indeed, the error patterns observed cross-sectionally can be considered relevant here only to the extent that States employing similar administrative practices could be expected to exhibit similar error rate levels.

In contrast, error rate changes from one time period to the next are more likely to reveal the effects on error of changes in administrative practices. Although year-to-year variation in error rates may also reflect changes in external factors, such factors are arguably less subject

¹The corresponding literature addresses similar issues arising in the Aid to Families with Dependent Children program. For instance, see the following: Evelyn Z. Brodtkin, "The Error of Their Ways: Reforming Welfare Administration through Quality Control," doctoral dissertation, Massachusetts Institute of Technology, 1983; Jerry L. Mashaw, "The Management Side of Due Process," Cornell Law Review, Vol. 59, 1974, pp. 772-837; and John Mendeloff, "Welfare Procedures and Error Rates: An Alternative Perspective," Policy Analysis, Vol. 3, 1977, pp. 357-374.

²See Michael J. Puma and David C. Hoaglin, "The Effect of Caseload and Socioeconomic Characteristics on Food Stamp Payment Error Rates," Abt Associates Inc., Cambridge, Massachusetts, April 10, 1987.

to change from period to period for any State. For these reasons, this study will give greater importance to the findings derived from analysis of error rate changes, as opposed to error rate levels. Since error measures are subject to sampling variability, care has been taken to examine the statistical significance of year-to-year changes in error rates, where such changes are the focus of analysis.

B. ORGANIZATION OF THE REPORT

Chapter Two of this report discusses the data and empirical methods used in the analysis. The quality control measurement system is briefly reviewed, with attention to those aspects of measured error rates that complicate either the analysis itself or the interpretation of findings. Chapter Three then presents the analysis of cross-sectional variation in error rates, assessing whether States with lower rates of overpayment error also tend to achieve lower (or higher) rates of underpayment error. Chapter Four examines year-to-year changes in error rates to establish whether the observed movements in overpayment and underpayment error by State are systematically related. Finally, Chapter Five presents a more generalized, multivariate analysis of the relationship between overpayments and underpayments, accounting for the effects of State-specific and time-specific circumstances.

CHAPTER TWO

DATA SOURCES AND STATISTICAL ISSUES

A. ERROR RATE DEFINITIONS AND MEASUREMENT

The principal sources of data for this study are the annual (or previously semiannual) reports issued by the Food and Nutrition Service for each quality control reporting period.¹ These reports contain the error rate findings by State for both active cases and negative case actions, but only the active caseload data have been used here. The negative case action reviews, unlike the active case reviews, address principally the procedural correctness of case actions and not the substantive correctness of the eligibility and benefit determinations. Specifically, a negative case action is considered correct if existing information in the case record sufficiently justifies the denial or termination. Moreover, a reported negative action error does not necessarily mean that the household lost benefits, since the agency may simply have failed to document its decision on a household that was ineligible for assistance. No information is collected on the dollar amount of forgone or lost benefits among those clients considered erroneously denied or terminated.

In contrast, the active case reviews include not only a review of the case record but also a full field investigation of the household's circumstances, in order to establish the benefit amount that the household was entitled to receive. Each State initially aggregates its findings for the reviewed sample cases and computes its "reported" error rates for "payment errors"--issuances to ineligible cases and overissuances to eligible cases--and for "underissuances" to eligible cases. (Eligible cases are considered correctly paid if the monthly benefit issuance is within \$5 of the entitlement determined in the quality control review.) The estimated extent of errors in the State's active caseload is computed both in terms of "case error rates," cases in error as a percentage of total cases, and "dollar error rates," issuances in error as a percentage of total issuances.

¹Since Fiscal Year 1983, these reports are each entitled "Food Stamp Quality Control Annual Report." For Fiscal Years 1980 through 1982, the reports were issued semiannually for the October-March and April-September periods and are each entitled, "Semiannual Summary Report of Food Stamp Quality Control Reviews."

Since Fiscal Year 1981, each State's "official" dollar error rates have reflected two federal adjustments. The first, based on the findings of federal re-reviews for a subsample of the State's completed sample, accounts for possible reporting bias in the State's findings. This statistically-derived "regression" adjustment is made separately to the dollar error rates for both overpayment and underpayment errors. The second adjustment, based on the extent to which the State fails to complete its review of sampled cases, provides an incentive for States to draw their required sample size and review all sampled cases that are subject to review. From 1981 through 1985, this latter adjustment was made only to the dollar error rate for overpayment; beginning with 1986, it is now also made to the dollar error rate for underpayment. (There has been no attempt by FNS to compute these adjustments retroactively in order to construct a consistent time series.)

For the purposes of this study, the following terminology is adopted, unless otherwise specified:

- overpayments--issuances to ineligible cases and overissuances to eligible cases;
- underpayments--underissuances to eligible cases;
- reported case error rate (for either overpayments or underpayments)--cases in error as a percentage of total cases, as reported by the State; and
- regressed dollar error rate (for either overpayments or underpayments)--issuances in error as a percentage of total issuances, reflecting the adjustments for federal re-review and sample noncompletion.

Exhibit 2.1 shows the national trend in the regressed dollar error rates for both overpayments and underpayments.

The analysis reported here uses a data set containing 585 State observations for regressed dollar error rates and reported case error rates. Data were available for 54 jurisdictions, including the 50 States, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands. For 53 of these jurisdictions, eleven annual observations were available, representing Fiscal Years 1980 through 1990. For Puerto Rico, observations were available only for 1980 and 1981, prior to the conversion of the program to a block grant. For analysis of year-to-year changes in error rates, this data set yielded 531 observations.

At the outset of this study, consideration was given to two adjustments to the regressed dollar error rates. As explained below, one was to modify the error rates in a way that would

EXHIBIT 2.1

NATIONAL AVERAGE ERROR RATES FOR OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1990

Fiscal year	National average error rate (%)	
	Overpayment	Underpayment
1980	9.51	2.35
1981	9.90	2.50
1982	9.54	2.44
1983	8.32	2.45
1984	8.59	2.32
1985	8.27	2.24
1986	8.09	2.27
1987	7.58	2.63
1988	7.41	2.53
1989	7.27	2.54
1990	7.34	2.46

SOURCE: U.S. Department of Agriculture, Food and Nutrition Service, Quality Control Annual Report.

remove the existing endogeneity of the error rate denominator. The second was to eliminate the effect of the federal adjustment for sample noncompletion. Since preliminary analysis showed that such corrections would be so trivial as to have no appreciable effect on the findings, neither was performed. Nevertheless, the issues are presented briefly here.

As to the nature of the error rate denominator, one might argue that the conventionally-computed error rates are ill-suited for analysis because the denominator, total issuances, is itself a function of the extent of error and is therefore endogenous. This could be corrected by dividing all dollar error rates by the corresponding value of $1-x+y$, where x and y are the conventionally-measured dollar error rates for overpayments and underpayments respectively. It turns out that error rates are only superficially affected by such corrections, since the value of $1-x+y$ is typically very close to 1. The correlation coefficient between the conventional and corrected dollar error rates is .9977 for overpayments and .9969 for underpayments, when computed for the 585 annual State observations.

As to the federal adjustment for sample noncompletion, one could argue on technical grounds that this adjustment introduces an arbitrary upward bias to the error rates for the affected States. Here again, however, it turns out that "corrected" estimates are so highly correlated with the conventionally-reported statistics that the correction seems unwarranted. The simple correlation coefficient between the corrected and uncorrected dollar error rates for overpayments is estimated at .9999, using the observations for which a corrected value can be readily computed.¹

¹The corrected values for the regressed overpayment dollar error rates (x') were computed

B. SAMPLING VARIATION AND STATISTICAL SIGNIFICANCE

Because the quality control measurement system operates through the review of randomly-selected cases in each State, the computed error rates are subject to sampling error. The error rate estimated for each State in each reporting period can be viewed as drawn from a distribution that is centered about the "true" caseload-wide error rate, but is subject to variation depending importantly upon the size of the sample. The dispersion of this "sampling distribution" is indicated by its variance, which can be readily computed for case error rates estimated from a simple random sample. (In such instances, with a sample of n cases, the variance of the estimated error rate p is simply $p(1-p)/n$.) For dollar error rates, or in instances where the sampling scheme is something other than simple random selection, the computation of the variance is more complicated.

Because this study focuses considerable attention on year-to-year changes in error rates for each State, the issue of sampling error becomes even more important. The variance of the change in the error rate is the sum of the variances of the separate annual rates, if one considers successive annual error rates in each State to be independent statistics.

For the regressed overpayment dollar error rates by State, the standard error (the square root of the variance) has been published by the Food and Nutrition Service only for Fiscal Years 1986-1990. For 1983-1985, Westat, Inc. computed the standard errors for all States subject to a liability.¹ Standard errors are available for the regressed underpayment dollar error rates in 1988, 1989, and 1990 only.

The approach taken in this study, when examining year-to-year changes in overpayments or underpayments, is to consider such changes to be significant only when different from zero at the 10 percent significance level. Where the information does not exist to perform such a test on the change in regressed dollar error rates, the test is performed on the corresponding change in reported case error rates. In such instances, this places reliance on the State's reported case error rate as a reasonable proxy for its regressed dollar error rate. For the pooled set of State observations from 1980 through 1989, the correlation between these error rates is expectedly

¹See Westat (1987), table A-1.

high, .785 for overpayments and .727 for underpayments. Where case error rates are used, the standard error is computed on the assumption of a simple random sample. This results in some imprecision for States that employed stratified sampling.

The need for attention to the sampling variability of the measured error rates is indicated by the finding that, of the year-to-year error rate changes observed from 1980 to 1990, more than two-thirds were not different from zero at the 10 percent significance level. This is true for the observed changes in regressed dollar error rates for overpayments and for changes in reported case error rates for overpayments and underpayments.

CHAPTER THREE

STATE-TO-STATE VARIATION IN ERROR RATES

A. CONCEPTUAL APPROACH

The issue addressed in this chapter is whether States with lower rates of overpayment error also systematically achieve lower (or higher) rates of underpayment error than other States in the same period. Any such systematic relationship would suggest, but only in a *prima facie* way, the direction of expected movement in the underpayment error rate for States that successfully lower their overpayment error rates.

This kind of inference, however, is weakened to the extent that States differ on dimensions other than their administrative procedures. The relative performance of States is seemingly affected by variation in circumstances such as caseload demographic characteristics and local socioeconomic conditions.¹ If interstate variation in the pattern of overpayment and underpayment error is indeed systematically related to variation in such factors, cross-sectional comparisons could be misleading as indications of expected error rate movements resulting from deliberate action in any particular State. Nonetheless, this cross-sectional analysis has merit as an initial exploratory step, to be contrasted later with the findings from examination of year-to-year error rate changes in each State.

The first published analysis of the cross-sectional relationship between overpayments and underpayments in the Food Stamp Program is contained in the 1985 FNS study. This earlier report found the correlation between regressed dollar error rates for overpayments and underpayments to be significantly positive in five of the eight semiannual review periods during Fiscal Years 1980 to 1983 (with values as high as .60), and not significantly different from zero in the remaining three periods (with values as low as .10).²

The 1988 Abt study, using annual QC data for 1980 to 1986, found somewhat stronger correlations between the regressed dollar error rates for overpayment and underpayment. For

¹See Puma and Hoaglin (1987).

²See Food and Nutrition Service (1985), p. 25.

each of the seven years, the correlation coefficient was significantly positive, with values ranging from .26 to .62.¹

The approach taken here was first to examine whether States below the median error rate for overpayments also tend to be below the median error rate for underpayments in the same period. The next step was to compute for each year the correlation coefficient between State error rates for overpayments and underpayments.

B. EMPIRICAL FINDINGS

In each year, one-half of States will by definition fall below the annual median error rate for overpayments. Separately, one-half will fall below the median for underpayments. The first question addressed here is whether a State below the median for one type of error also tends to be concurrently below the median for the other type of error.

Based on the 585 available State observations for annual regressed dollar error, pooled over the eleven-year historical period, States below the median error rate for overpayments are very likely to be at the same time below the median underpayment error rate (Exhibit 3.1). Specifically, 63 percent (182/288) of the State observations below the overpayment median were also below the corresponding underpayment median. In other words, a State that does better than others on overpayment error also tends to do better than others on underpayment error.

The standard approach for examining the degree of association between such error rate measures is to compute the correlation coefficient between them, as was done in the 1985 FNS study. Here, the correlation was computed for each of the eleven annual reporting periods and also for the observations pooled over the entire eleven-year interval (Exhibit 3.2). In all instances, the correlation coefficient was positive. The values of the coefficient ranged from .256 in 1981 to .616 in 1980.²

These findings indicate that States with lower overpayment error than other States also tend to achieve lower underpayment error. However, for the reasons cited earlier, this evidence

¹See Mills (1988), p.19.

²The 1980 data are unusual in not being subject to either the federal re-review or sample noncompletion adjustments.

EXHIBIT 3.1

RELATIONSHIP OF STATES TO ANNUAL MEDIAN ERROR RATES FOR OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1990

Relationship to annual median underpayment error rate			
	Below median	At or above median	Total
Number of State observations			
Relationship to annual median overpayment error rate			
Below median	182	106	288
At or above median	105	192	297
Total	287	298	585

EXHIBIT 3.2

CORRELATION BETWEEN OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1990

Fiscal year	Correlation coefficient	Number of State observations^a
1980	.616	54
1981	.256	54
1982	.343	53
1983	.437	53
1984	.542	53
1985	.597	53
1986	.404	53
1987	.597	53
1988	.390	53
1989	.345	53
1990	.363	53
Pooled total	.385	585

Note: a. Error rate data for Puerto Rico are not available after Fiscal Year 1981, due to the subsequent conversion of the program to a block grant.

cannot be viewed as proving that States reducing their overpayment error are also able to reduce their underpayment error.

CHAPTER FOUR

STATE-SPECIFIC VARIATION IN ERROR RATES

A. CONCEPTUAL APPROACH

As stated earlier, the policy concern that motivates this study is the possibility that federal emphasis on reducing overpayment error may prompt States into actions that cause higher underpayments. Without the appropriate experimental data, these relationships must be inferred indirectly from historically-observed variation in error rates, as affected not only by deliberate corrective actions, but also by caseload demographic characteristics and socioeconomic conditions. The empirical approach must seek to minimize the confounding effects on error of these other factors.

One strategy for doing this is to conduct separate analyses of error rates on a State-by-State basis, where one might assume the external factors to be unchanged. However, the eleven-year historical period is long enough to call into question any such assumption of stable environmental conditions. A second strategy is to conduct the analysis on changes in error rates from one year to the next, during which time the non-administrative conditions in each State are again assumed to be relatively stable (though different from State to State). One can thereby justify a pooling of the observed year-to-year changes over all States and years. Both strategies have been employed here.

The 1985 FNS study also conducted both State-by-State analysis of error rate interrelationships and pooled analysis of changes in error rates. Based on eight semi-annual observations of regressed dollar error rates per State, for 1980 through 1983, the correlation coefficient between overpayments and underpayments was found to be significantly positive for six States (ranging in value from .63 to .97) and significantly negative for one State (-.78). Based on the six review periods for 1981 to 1983, during which time a federal policy of error rate liabilities was in force, the correlation was found to be significantly positive for four States (from .74 to .97) and significantly negative for four States (from -.73 to -.78). The study interpreted these mixed results as evidence of no systematic interrelationship between the two types of error.

In examining error rate changes, the FNS study first ranked States according to the percentage change in their overpayment error rate from the first half of 1980 to the second half of 1983. It then examined the direction of change in the State's underpayment error rate. The study reported that, of the fifteen States with the largest proportional decrease in overpayments, ten also experienced a decrease in underpayments. Meanwhile, of the fifteen States with the largest proportional increase in overpayments, thirteen also experienced an increase in underpayments. The study thereby cited the "tendency for those States that have done well in reducing their overpayment error rates to have also done well in reducing their underpayment error rates." (p. 12)

One of the issues not addressed by the FNS study is the statistical significance of observed period-to-period changes in sample-determined error rates. Whenever possible in the analysis conducted here, any year-to-year error changes that fail a test of statistical significance are regarded as not meaningful.

B. EMPIRICAL FINDINGS

As a first step in examining State-specific error variation, the eleven annual observations for each jurisdiction were used to compute a State-specific correlation coefficient between the regressed dollar error rates for overpayments and underpayments (Exhibit 4.1). Of the 53 States subject to analysis, 13 have correlations that are significantly positive, ranging from .525 to .883. Two States, Louisiana and Wyoming, have a significant negative correlation.

The next step was to compute the correlation coefficient between the year-to-year change in overpayments and the corresponding change in underpayments (Exhibit 4.2). Changes were computed here as the absolute difference between the two annual error rates.¹ For the pooled set of 531 observations, the correlation was found to be .117. Among the ten separate year-to-year intervals, the correlation ranged from -.094 to .265, and eight of the ten values were

¹If each year-to-year change is instead expressed as a percentage of the prior year's error rate, the findings are largely unaffected.

EXHIBIT 4.1

STATES WITH STATISTICALLY SIGNIFICANT CORRELATION BETWEEN OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1990

State		Correlation coefficient
1.	Michigan	.883***
2.	Connecticut	.851***
3.	South Dakota	.846***
4.	Oregon	.740***
5.	Arkansas	.734**
6.	Wisconsin	.712**
7.	Hawaii	.651**
8.	Arizona	.643**
9.	Utah	.639**
10.	Colorado	.616**
11.	West Virginia	.539*
12.	Oklahoma	.536*
13.	Nevada	.525*
14.	Louisiana	-.659**
15.	Wyoming	-.695**
Number of annual observations per State		11
Number of States subject to analysis		53

* Different from zero at the 10 percent significance level.

** Different from zero at the 5 percent significance level.

***Different from zero at the 1 percent significance level.

EXHIBIT 4.2

CORRELATION BETWEEN YEAR-TO-YEAR CHANGES IN OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1990

Fiscal years	Correlation coefficient	Number of State observations ^a
1980 to 1981	.115	54
1981 to 1982	-.018	53
1982 to 1983	.104	53
1983 to 1984	.244	53
1984 to 1985	.265	53
1985 to 1986	.042	53
1986 to 1987	-.094	53
1987 to 1988	.226	53
1988 to 1989	.125	53
1989 to 1990	.173	53
Pooled total	.117	531

Note: a. Error rate data for Puerto Rico are not available after Fiscal Year 1981, due to the subsequent conversion of the program to a block grant.

positive. Such positive correlations indicate that both types of error were moving systematically in the same direction.

However, the correlations themselves do not indicate whether the movement in error rates was systematically upward or downward, even though the central interest here is on the change in underpayments accompanying a reduction in overpayments. In addition, the correlations are computed on the basis of year-to-year changes that reflect a substantial degree of sampling variation. For these reasons, contingency tables were constructed to indicate the directional pattern of significant changes in overpayments and underpayments. As discussed in Chapter Two, limited information on the standard errors of regressed dollar error rates required the use of reported case error rates, and the estimated standard error of each observed year-to-year change, to test the statistical significance of upward and downward error rate movements.

The data set provided 531 observed year-to-year changes in case error rates, for both overpayments and underpayments. Each of these changes was classified as either a significant increase, a significant decrease, or not significantly different from zero (at the 10 percent significance level). The changes for overpayments and underpayments were then cross-tabulated to create a three-by-three contingency table (Exhibit 4.3). Although more than one-half of the total number of observations (260 of 478) involved no significant change for both overpayments and underpayments, a systematic pattern is present.

Perhaps of greatest interest are the 97 observations for which there was a statistically significant reduction in overpayments. In two-thirds of these instances (66 of 97), there was no significant change in underpayment error. Where a significant change in underpayments occurred, decreases were nearly twice as likely as increases (20 versus 11). The tendency for the two error rates to move in a similar direction also prevailed in the 56 instances where overpayments increased significantly. The corresponding shift in underpayments, if significant, was in each instance also an increase in error.

A similar contingency table was constructed using the available data on the standard errors of the regressed overpayment dollar error rates (Exhibit 4.4). This table displays the direction of change in the reported underpayment case error rate, by the corresponding change in the regressed overpayment dollar error rate, for year-to-year changes between 1983 and 1989.

EXHIBIT 4.3

STATISTICAL SIGNIFICANCE OF YEAR-TO-YEAR CHANGES IN OVERPAYMENT AND UNDERPAYMENT REPORTED CASE ERROR, FISCAL YEARS 1980 TO 1989

Year-to-year change in reported underpayment case error rate				
	Significant decrease*	No significant change	Significant increase*	Total
Number of State observations				
Year-to-year change in reported overpayment case error rate				
Significant decrease*	20	66	11	97
No significant change	27	260	38	325
Significant increase*	0	44	12	56
Total	47	370	61	478

*Different from zero at the 10 percent significance level.

EXHIBIT 4.4

STATISTICAL SIGNIFICANCE OF YEAR-TO-YEAR CHANGES IN REGRESSED OVERPAYMENT DOLLAR ERROR AND REPORTED UNDERPAYMENT CASE ERROR, FISCAL YEARS 1983 TO 1989

Year-to-year change in reported underpayment case error rate				
	Significant decrease*	No significant change	Significant increase*	Total
Number of State observations ^a				
Year-to-year change in regressed overpayment dollar error rate				
Significant decrease*	7	28	6	41
No significant change	21	197	32	250
Significant increase*	0	15	3	18
Total	28	240	41	309

*Different from zero at the 10 percent significance level.

Note: a. Due to limited information on the standard errors of the regressed dollar error rates for overpayments, the number of observations for this tabulation of year-to-year changes in error rates is as follows: 48 for 1983-to-1984, 49 for 1984-to-1985, and 53 each for 1985-to-1986, 1986-to-1987, 1987-to-1988, and 1988-to-1989.

Here, with a smaller number of observations, one can not establish any systematic movement in the two error rates.

A final contingency table was constructed to test more specifically the effect on underpayment error of federal quality control liabilities that focus only on overpayment error. In 1983 States first became subject to such "unbalanced" incentives. States either had to meet a fixed national target rate for regressed dollar overpayments (9 percent in 1983, 7 percent in 1984, or 5 percent in 1985) or had to achieve a phased reduction in overpayments (for 1983 or 1984 only). States then continued to operate under unbalanced incentives for 1986 through 1988, facing a 5 percent tolerance level for overpayments. The Hunger Prevention Act of 1988 re-established balanced incentives, as had prevailed in 1981 and 1982, with liabilities based on an error rate that includes underpayments as well as overpayments.¹ These policy shifts enable us to examine the pattern of year-to-year movements in underpayment error under both "balanced" and "unbalanced" liability systems.

If the contention is valid that underpayments tend to be higher in situations where the avoidance of liabilities requires a reduction in overpayments but not underpayments, we would expect to observe differences in the movement of underpayment error between the following situations:

- situations in which a State needed to reduce overpayments and underpayments combined, or neither, to avoid a liability; and
- situations in which a State needed to reduce overpayments (but not underpayments) to avoid a liability.

We assigned the following year-to-year changes to the first category:

- those observations corresponding to years in which liabilities were based on a combined measure that included both overpayments and underpayments (i.e., all observations for 1980-to-1981, 1981-to-1982, and 1988-to-1989); and

¹Note that the Hunger Prevention Act, although retroactive to Fiscal Year 1986 for fiscal liabilities, was not passed until September 1988. We presume that, for Fiscal Years 1986, 1987, and 1988, States acted as if liabilities were based on overpayment errors only.

- for years in which liabilities were based on overpayments only, those observations corresponding to States whose overpayment error rate in one year was less than their target error rate for the following year (e.g., those 1982-to-1983 observations for which the 1982 overpayment error rate was below 9 percent, those 1983-to-1984 observations for which the 1983 overpayment error rate was below 7 percent, and those 1984-to-1985, 1985-to-1986, 1986-to-1987, and 1987-to-1988 observations for which the overpayment error rate was below 5 percent in 1984, 1985, 1986, or 1987 respectively.¹)

We assigned all other observations to the second category. If the need to reduce overpayment error prompts States into actions that increase underpayment error, we would expect to see in this second category a tendency toward increased underpayments, in comparison to the first category.²

Between these two categories, the observations of year-to-year changes in the reported case error rate for underpayments were divided almost equally, 229 versus 249 (Exhibit 4.5). A two-by-three contingency table was then constructed by subdividing the observations within each category according to the directional change in underpayments. The tendency of States to experience a significant increase in underpayments was not markedly different between the two categories.³

¹Also included in this category were the observations corresponding to States whose error rate in 1982 or 1983 was below its State-specific target for 1983 or 1984 respectively.

²This comparison admittedly abstracts from the reality that there are time lags in the reporting of error findings, in the administrative response of States to the need for error reduction, and in the effects of corrective action on error rates. The limited body of available data does not permit analysis of such lags.

³In a related finding of some policy interest, States needing to reduce overpayments to avoid a liability were more likely to have achieved a significant reduction in their regressed overpayment error rate. This is based on a two-by-three contingency table (not shown here) using the 309 year-to-year observations from 1983 to 1989 for which the standard error of the regressed overpayment error rate is available (as in Exhibit 4.4).

EXHIBIT 4.5**CHANGE IN REPORTED UNDERPAYMENT CASE ERROR
BY WHETHER STATE NEEDED TO REDUCE
OVERPAYMENTS TO AVOID LIABILITY,
FISCAL YEARS 1980 TO 1989**

Year-to-year change in reported underpayment case error rate				
	Significant decrease*	No significant change	Significant increase*	Total
Number of State observations				
State status regarding liability				
No need to reduce over- payments to avoid liability	18	184	27	229
Needed to reduce overpayments to avoid liability	29	186	34	249
Total	47	370	61	478

*Different from zero at the 10 percent significance level.

CHAPTER FIVE

MULTIVARIATE ANALYSIS OF ERROR RATES

A. CONCEPTUAL APPROACH

The analysis reported thus far has proceeded largely in a bivariate framework, where overpayment and underpayment error rates are both treated as outcome variables, subject to some unknown degree of association. We measured the statistical relationships without taking explicit account of other factors that might affect error.

This chapter introduces a more formal modelling framework, treating the regressed dollar underpayment error rate observed in each State in each year as the outcome variable, with the corresponding overpayment error rate (its level and/or its change from the prior year) treated as an explanatory variable amidst many other contributing effects. In particular, each State is assumed to exert an effect on underpayments that is different from other States, as a result of its distinctive combination of policy provisions, administrative practices, demographic characteristics, socioeconomic conditions, and other circumstances influencing payment accuracy. This "State effect" is assumed to be constant for each State across all time periods.

Similarly, each time period is assumed to contribute an effect on underpayments, as a result of nationwide factors that exert the same influence on all States in any given year. This "time effect" corresponds to such factors as federal program policies, quality control measurement procedures, or macroeconomic conditions.

In explaining the observed variation in underpayment error, the State effects, time effects, and overpayment effects are each assumed to contribute in a linear, additive fashion that can be estimated by ordinary least-squares regression. The State effects and time effects are measured by the inclusion in the regression model of separate dummy variables for each State and year (with one State and one year designated as reference points for the purpose of estimating the model).

Because the underpayment error rate is a variable bounded by zero and one, it is ill-suited as a dependent variable for ordinary least-squares estimation. Consistent with accepted practice in such instances, the dependent variable is constructed here as the logistic (or logit) transform

of the underpayment error rate, by taking the natural logarithm of the ratio between the error rate and its complement (one minus the error rate).

Given this general structure of the regression model, we estimated four separate equations to test the possible effects of overpayment error on the underpayment error rate when controlling for the State effects and time effects. Equation 1 includes only the State and time dummy variables. In Equation 2, the overpayment error rate was also entered. In Equation 3, the year-to-year change in the overpayment error rate was entered (but not its level). In Equation 4, both the level of overpayment error rate and its year-to-year change were entered. Each equation was estimated with a constant term.

Formally, the regression equations can thus be expressed as follows:

$$\begin{aligned}
 1. \quad 1n \left[\frac{y_{it}}{1 - y_{it}} \right] &= k_1 + a_{1i} + b_{1t} + e_{it} \\
 2. \quad 1n \left[\frac{y_{it}}{1 - y_{it}} \right] &= k_2 + a_{2i} + b_{2t} + c_2 x_{it} + f_{it} \\
 3. \quad 1n \left[\frac{y_{it}}{1 - y_{it}} \right] &= k_3 + a_{3i} + b_{3t} + d_3 (x_{it} - x_{i,t-1}) + g_{it} \\
 4. \quad 1n \left[\frac{y_{it}}{1 - y_{it}} \right] &= k_4 + a_{4i} + b_{4t} + c_4 x_{it} + d_4 (x_{it} - x_{i,t-1}) + h_{it}
 \end{aligned}$$

where x_{it} is the regressed overpayment dollar error rate for State i in year t , and y_{it} is the regressed underpayment dollar error rate for State i in year t , both expressed in decimal terms. The constant terms are k_1 , k_2 , k_3 , and k_4 . The State effect for State i in Equation m ($m = 1, 2, 3, 4$) is a_{mi} , except that the State effect for Alabama ($i = 1$) is estimated by the constant term. Similarly, the time effect for year t in Equation m is b_{mt} , with the effect for 1981 ($t = 1$) estimated by the constant term. Thus, for example, in Equation 1, k_1 gives the fitted value of

the dependent variable for Alabama in 1981. The random error terms are e_{it} , f_{it} , g_{it} , and h_{it} . All equations were estimated on the same set of 530 observations, which excluded the observations for 1980 (due to the absence of data on the 1979-to-1980 change in overpayment error) and the single available observation for Puerto Rico.¹

B. EMPIRICAL FINDINGS

For each equation, 56 to 57 percent of the variation in the dependent variable is explained by the included independent variables (Exhibit 5.1). The State effects are, as a joint set, statistically significant in each equation. The time effects (measured relative to 1981) are negative and statistically significant for 1984, 1985, and 1986, in each equation, with the year 1985 exhibiting the strongest negative effect.² As the estimated effects for 1989 and 1990 appear no different from the prior several years, there is no discernible shift in error patterns since passage in 1988 of the Hunger Prevention Act.

The estimated coefficients on the level of the overpayment error rate in Equations 2 and 4 are positive and statistically significant. This indicates, consistent with the previous findings, that lower overpayments are associated with lower underpayments. In contrast, the year-to-year change in overpayments is not a significant predictor of the underpayment error rate, whether or not the level of overpayments is included in the equation. The overpayment variables contribute only marginally to explaining the variation in the underpayment error rate, as the

adjusted R-squared for Equation 1 is nearly as high as that for each of the other equations.

The parameter estimate for the coefficient on the overpayment error rate can be used to calculate the effect on the underpayment error rate of a one percentage point change in the overpayment error rate. This estimated effect is .06, when evaluated at the sample mean error

¹We also estimated some equations with the year-to-year change in the underpayment error rate as the dependent variable. However, none of these questions offered significant explanatory power, using any of the above sets of independent variables.

EXHIBIT 5.1

REGRESSION ESTIMATES

Dependent variable: Regressed underpayment dollar error rate
(logit transform)

Number of State observations: 530 (excluding those for 1980 and for Puerto Rico)

Explanatory variable	Equation 1	Equation 2	Equation 3	Equation 4
Estimated coefficients				
Intercept	-3.83***	-4.13***	-3.84***	-4.15***
State effects	a***	a***	a***	a***
Time effects ^b				
1982	-.02	-.01	-.01	-.01
1983	-.06	-.02	-.04	-.03
1984	-.15***	-.10*	-.14**	-.10*
1985	-.22***	-.16***	-.21***	-.16***
1986	-.20***	-.12**	-.19***	-.12**
1987	-.07	.02	-.06	.02
1988	-.14**	-.04	-.13**	-.04
1989	-.07	.02	-.07	.03
1990	-.06	.04	-.05	.05
Regressed overpayment dollar error rate				
Level	---	2.85***	---	3.05***
Year-to-year change	---	---	1.13*	-.38
Summary statistics				
Degrees of freedom	468	467	467	466
Adjusted R-squared	.560	.574	.562	.574
F statistic	12.03***	12.51***	11.93***	12.29***

* Different from zero at the 10 percent significance level.

** Different from zero at the 5 percent significance level.

***Different from zero at the 1 percent significance level.

Notes: a. Statistical significance of the included set of dummy variables is computed jointly by an F test.

b. Effects estimated relative to 1981.

rates using the parameter estimate from Equation 2.¹ This value implies that a decrease in the overpayment error rate of 1 percentage point (at the sample mean, from 7.82 to 6.82 percent) is associated with a decrease in the underpayment error rate of .06 percentage points (at the sample mean, from 2.24 to 2.18 percent). When expressed as an elasticity, evaluated again at the sample means, the estimated parameter implies that a proportional decrease of one percent in the overpayment error rate is associated with a proportional decrease of .22 percent in the underpayment error rate.²

These multiple regression findings can be summarized as follows. A State's annual underpayment error rate cannot be predicted well by information about the State's overpayment error rate--either about the overpayment error rate itself, its change from the previous year, or both. To the extent that the overpayment and underpayment error rates are systematically related, after adjusting for State-specific and time-specific effects on error, a lower overpayment error rate is associated with a lower underpayment error rate. These findings thus do not support the view that States tend to reduce overpayment error in ways that result in higher underpayment error. Finally, the year-specific effects estimated for 1989 and 1990 show no distinctive shift in error patterns that one might attribute to the enactment of the Hunger Prevention Act.

¹Under the notation introduced earlier, this effect can be derived as $c_2y(1-y)$. Its value, estimated at the sample mean of y , is $(2.85)(.0224)(.9776) = .062$.

²When one includes the prior-year underpayment error rate as an additional explanatory variable, the estimated current-year relationship between overpayment and underpayment becomes somewhat lower in magnitude, but is still significantly different from zero.